

REMARKS

Claims 2-5, 14-16, and 20-22, are all the claims pending in the application. Reconsideration and allowance of all the claims are respectfully requested in view of the following remarks.

Election/Restriction

The Examiner has withdrawn from consideration claims 2-5 and 20-22 as being drawn to a non-elected invention. See 37 C.F.R. § 1.142(b).

Claim Rejections - 35 U.S.C. § 103

The Examiner rejected claims 14 and 16 under § 103(a) as being unpatentable over JP 61-074791 to Sugawara (hereinafter Sugawara) in view of US Patent 4,504,727 to Melcher et al. (hereinafter Melcher). Applicants respectfully traverse this rejection because the references fail to teach or suggest all the elements as set forth in the claims.

Claim 14 sets forth a laser beam machining method for a wiring board, comprising: forming a metallic layer having a desired shape by partially removing the metallic layer by pulse irradiation with a laser beam having sufficient intensity to melt and remove the metallic layer.

For example, as shown in Fig. 22, one embodiment consistent with that set forth in claim 14 is a laser beam machining method for a wiring board 1E, comprising: forming a metallic layer 2 having a desired shape by partially removing the metallic layer by pulse irradiation with a laser beam 27 having sufficient intensity to melt and remove the metallic layer. In this manner, even when the metallic layer is not previously removed in another step such as etching, the machined portion may be irradiated with the pulsed laser beam. It is thus possible to finely remove the top metal layer with little effect of heat on the periphery of the removed portion. It is thereby possible to omit the etching serving as a previous step which is essential in the prior art, and thereby simplify the manufacturing steps. See also, page 44, line 28 - page 47, line 12.

The Examiner, citing to its abstract, asserts that Sugawara teaches forming a metal layer having a desired shape by partially removing the metallic layer by pulse irradiation with a laser beam.¹ The Examiner's interpretation of Sugawara is mistaken. In contrast to that set forth in claim 14, and that asserted by the Examiner, Sugawara's abstract teaches the "[d]esired hole diameter 3a, 4b in copper foils ... is removed by etching." Sugawara then goes on to teach that the "[l]aser light is irradiated ... on the part from where copper is removed by etching ...". Again, see the abstract. That is, Sugawara fails to teach or suggest using a laser to remove the metallic layer by pulse irradiation.

Similarly to Sugawara, Melcher also fails to teach or suggest removing a metallic layer by pulse irradiation. For example, Melcher teaches "drilling of a hole through the epoxy-glass layer 65" and then turning the laser beam off once the copper layer 67 is reached.²

Accordingly, even assuming that one of ordinary skill in the art were motivated to combine Sugawara and Melcher as suggested by the Examiner, any such combination would still not teach or suggest at least removing a portion of a metallic layer by pulse irradiation with a laser beam having sufficient intensity to melt and remove the metallic layer, let alone teach or suggest thereafter performing an additional irradiation through the metallic layer removed portion with an intensity insufficient to melt the metallic layer, as set forth in claim 14.

For at least any of the above reasons, Sugawara and Melcher fail to render obvious claim 14. Likewise, these references fail to render obvious dependent claim 16.

¹ Office Action at page 2, last paragraph, lines 2-4.

² Melcher at col. 5, lines 34-49, and col. 6, lines 33-44.

Allowable Subject Matter

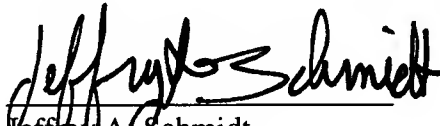
Applicants thank the Examiner for indicating that claim 15 would be allowable if rewritten in independent form. However, Applicants have not written claim 15 in independent form at this time because of the belief that claim 14 is allowable as written.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,


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